

MISSOURI resources

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Are You Up to the Challenge?



Photo by Loring Bullard



Above right: A sign on a vacant hotel in Excelsior Springs hints at Missouri's rich history of mineral spas and resorts.
Above: Multi-colored salt crystals form on leaves and algae at a mineral spring in Saline County.



Cover: The City Hospital in St. Louis, which was listed on the National Register of Historic Places in 2001, is an example of a brownfield that currently is in the process of a multi-million-dollar redevelopment.

Cover photo by Scott Myers

Brownfields Diamonds in the Rough

by Chris Cady and Tim Chibnall
photographs by Scott Myers

Every morning, Sarah walks six blocks to school through a vacant lot. Rain or shine, she crosses that weedy lot where the city tore down abandoned buildings before she was born. What Sarah does not know – in fact, no one has yet realized – is that the soil beneath her sneakers is contaminated with the residue of America's industrial past. Though she might not recognize the term, she knows what a brownfield is, and so do thousands of others across Missouri and the rest of the nation. The U.S. Environmental Protection Agency (EPA), defines brownfields as "abandoned, idled, or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination." The name comes from their appearance – weed-covered and run-down.

In a landmark study, the U.S. General Accounting Office estimated that as many as 500,000 brownfield sites exist in the United States. Ranging from corner gas stations to multi-acre industrial facilities, they account for millions of acres of unused land, billions in lost tax revenue and thousands of lost jobs. Over the last decade, federal and state agencies have given them a name and started to do something about these rust spots on America's industrial crown.

Brownfields result from a complex mix of socioeconomic and environmental factors. Urban flight and the decline of heavy industry are major causes. Ironically, environmental laws intended to hold polluters liable for environmental

damage are partly responsible. The federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the Superfund Law and enacted in 1980, provided for the cleanup of dangerous hazardous waste sites, holding the owners liable for cleanup costs.

The cleanups of places like Love Canal, New York and Missouri's Times Beach, were possible through CERCLA. But the Superfund net caught up a larger than intended universe of sites. Developers, investors and lenders fear involvement with even a potentially contaminated site.

Missouri Department of Natural Resources Director Steve Mahfood says, "Brownfields are the next generation of environmental cleanup sites. We've taken care of Times Beach. Now we're recognizing another universe of less contaminated sites that are affecting our communities by their sheer numbers."



Vacant since 1985, St. Louis City Hospital is a large complex of 18 buildings that is currently being rehabilitated for residential and commercial use.

When cleanup costs exceed the value of the real estate, owners understandably prefer letting the property sit idle or allowing it to fall into tax foreclosure. The City of St. Louis, for example, owns 12,000 properties, one-third of its land area, mostly through property tax foreclosures. These sites are not all contaminated. While some sites do turn out to be contaminated, some brownfields persist in perception alone.

Financial incentives can help brownfield redevelopment projects compete with suburban "greenfield" developments. Liability must be reduced, first with a clear statement by regulatory agencies of what clean actually is, followed by state and federal assurances that cleanups meet with their approval. Developers must be drawn in by the potential that some prime locations offer.

In 1995, EPA announced the National Brownfields Initiative. Realizing that hard data about a site's condition was key to attracting new development, the agency has

awarded 400 pilot grants of up to \$200,000 to local communities to access specific properties. In Missouri, St. Louis, Wellston, Bonne Terre, Kansas City, St. Joseph and Springfield have received grants. Missouri also has a strong program involving the Missouri Department of Natural Resources and the Department of Economic Development (DED). The state program picks up where EPA leaves off, offering state tax credits that can pay for up to 100 percent of cleanup costs, up to the value of the predicted economic benefit.

The Department of Natural Resources' Voluntary Cleanup Program (VCP) provides a framework to allow developers to step up to the plate, perform testing and cleanup on a parcel of property on a voluntary basis and receive a valuable incentive in return: A "Certification of Completion" stating that the site is clean and that the department - and by proxy, the EPA - will take no future actions.

Key is the concept of risk-based cleanup standards. Rather than cleaning up each site to pristine conditions, risk-based standards acknowledge that a site does not have to be as clean as a shopping center or a home. Missouri's VCP uses risk-based standards set forth in its Cleanup Levels for Missouri (CALM) guidance.

Like lighting a candle in a dark room, redeveloping a key brownfield property can spark the revitalization of an entire neighborhood. One such project is the Martin Luther King Business Park, a 16-block downtown area targeted for redevelopment by the City of St. Louis. The St. Louis Development Corporation (SLDC), an arm of the city government, acquired and consolidated small properties to offer sites for commercial development. Lots were affected by a century of old gas stations, metal plating shops, junkyards, printing companies, asbestos and lead paint.

Starting in 1993, using Missouri's first EPA Brownfield Pilot grant, SLDC investigated the sites. This allowed potential developers to factor cleanup costs into a deal. Using state tax credits, the Martin Luther King Business Park is being cleaned up and redeveloped. A medical instrument supplier occupies one block, while six additional blocks are home to 480,000 square feet of new, state-of-the-art warehouse and light manufacturing space. Contamination has been cleaned up, dangerous buildings have been demolished, and new jobs are starting to bolster the city's economy.

Since 1995, 11 Missouri brownfield properties have been completed. Together with the 27 sites now under investigation and cleanup, they account for an estimated 7,500 jobs. Approximately \$20 million in remediation tax



The Laclede Power Building is one of many brownfields near downtown St. Louis.

credits have been issued under Missouri's program. While this represents a small fraction of Missouri brownfields, the economic, human health and environmental benefits easily justify the effort.

Numerous privately owned sites have been cleaned up through the VCP since 1995. The successful program recently issued its 100th clean letter, representing a total of 600 acres of land addressed under the VCP. More than 150 total sites currently are enrolled, and participants even pay the state's oversight costs.

The cleanup and redevelopment of urban properties is a necessity as inner cities are drained of population and tax revenue while suburbs continue to expand. Yet, brownfields are not strictly an urban problem. There are sites in smaller towns and rural areas suffering the same neglect as big-city sites.

These days, thanks to brownfield redevelopment, Sarah walks on a brand-new sidewalk past a new manufacturing facility where her uncle and brother now work. Fewer families are moving out of the city, an increased tax base has improved the school facilities, the whole neighborhood is cleaner for everyone, and one less suburban meadow has gone under the bulldozer.

Some happy endings deserve repeating. For information, call the Voluntary Cleanup Program at (573) 526-8913 or visit our Web site at [\[www.dnr.state.mo.us/deq/hwp/hwpvcp.htm\]](http://www.dnr.state.mo.us/deq/hwp/hwpvcp.htm).

Chris Cady and Tim Chibnall are environmental specialists with the department's [Hazardous Waste Program](#), Voluntary Cleanup Section.



Director's Comment

Spring is finally here – it's always a welcome season to me. Like you, I enjoy the promise of more sunshine, warmer breezes and the beautiful blooms of all the flowers. As always, I encourage you to get out and enjoy Missouri state parks and historic sites.

This spring, one of the most important issues we're currently working on involves ensuring that the health of citizens in Herculaneum is protected. The Doe Run lead smelter has operated in Herculaneum for more than 100 years. Last summer, in response to citizen concern, we sampled lead dust along the road, finding levels at 300,000 parts per million – well over the 400 parts per million that triggers a cleanup.



As a result, the Missouri Department of Health and Senior Services determined that the lead contamination in Herculaneum poses a clear and present risk to public health and an imminent and substantial endangerment to the citizens, especially to young children and pregnant women.

Gov. Holden has asked the U.S. Environmental Protection Agency (EPA) to do whatever is necessary to protect the health of the citizens, particularly the children, from lead contamination in the Herculaneum area. It is absolutely essential that we use every means at our disposal to decrease exposure to lead contamination quickly.

Meanwhile, internally, the department is continuing to move forward with our outreach efforts. In our new Outreach and Assistance Center, we are bringing people together with solutions, whether that's providing financial assistance or putting people in touch with the resources that can best assist them.

We're already developing partnerships both outside and inside the department that will better serve our citizens. For example, our historic preservation and our energy employees are now teaming up to visit old courthouses. This simultaneously assists communities with efficient energy and historic preservation discussions.

We have established a Community Assistance Office within the center. This office will house people who will serve as liaisons between all our department programs and anyone affected by what we do. Our focus will be on providing financial and technical assistance to anyone who needs help. This office will serve as a one-stop shop. I feel very strongly that providing a single point of contact into the department will allow us to better serve Missouri citizens.

Most of you are aware that we have established a departmental outreach office in the St. Louis area. On the other side of the state, the Kansas City Discovery Center will be completed soon. Staff will provide outreach services and serve as a liaison to the area's historic preservation, energy and environmentally regulated communities, and the public.

If you'd like to learn more about these issues, please call 1-800-361-4827 or e-mail nrpattc@mail.state.mo.us. I look forward to hearing from you.

Steve Mahfood

Missouri Department of Natural Resources



Taking a Byte Out of Solid Waste

The wastebasket, burn barrel or landfill are not the appropriate final resting places for used computer floppy disks and videotapes. With the help of an innovative non-profit company in Columbia, discarded software disks and videotapes can provide renewed service. Since reuse is preferred over recycling in the solid waste management field, the purchase and use of disks later marketed by GreenDisk of Redmond, Wash., closes the recycling loop on these items.

Don Lafferty, executive director of Alternative Community Training Inc. (ACT!), said his firm, with a staff of eight non-disabled employees, provides training for 44 significantly disabled adults. Lafferty says the disks and tapes come to ACT! from every state except Hawaii and Alaska. Companies can donate their disks and tapes and obtain a charitable credit for the fair market value of the products.



According to Lafferty, the key to reconditioning computer disks is the assurance to donating companies or individuals that the information or images on the disks or videotapes is fully erased. Companies previously had been required to landfill or burn their outdated or flawed disks.

GreenDisk reports on [www.greendisk.com] that the computer industry estimates that over 1 billion disks are discarded each year. Less than 30 percent of discarded software packages are recycled. If sent to a landfill, it would take this material over 450 years to degrade. Used 3.5-inch disks, CDs and videotapes are shipped to ACT! where they are magnetically erased, inspected and evaluated. Disks and CDs are taken apart and the plastic and metal components are recycled to make new disks and other items. Tapes then are cleaned, packaged and resold.

For further information on shipping disks and videotapes to ACT! or closing the loop by buying GreenDisk disks, call (573) 474-9446 in Columbia or 1-800-DISK (3475) at GreenDisk.

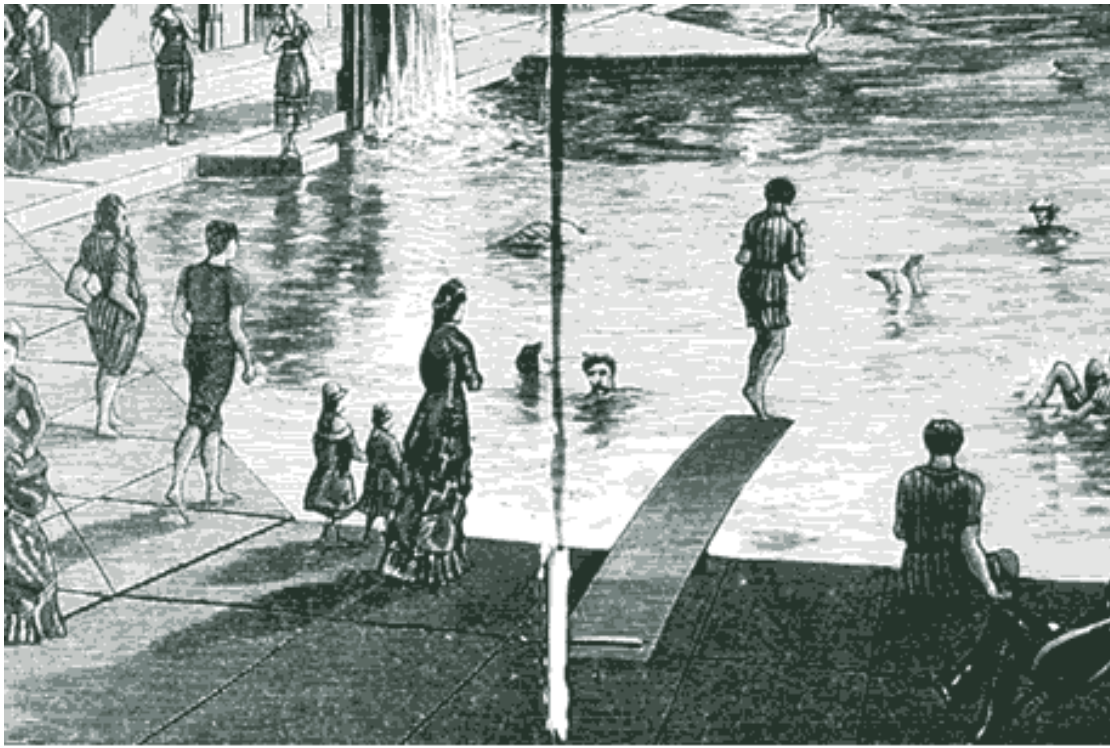


Healing Springs

by Loring Bullard

Relaxing recently in the foyer of the Hall of Waters at Excelsior Springs, Mo., proprietor Vicki Bates recalled a time when "taking the waters" was in vogue. Early in the 20th century, business was booming at Excelsior Springs' mineral water spas, clinics and bottling establishments. But with success came the inevitable hucksters. "You can imagine this sea of snake-oil salesmen," Vicki mused, "latching onto potential customers as they arrived on the train or left their hotels." In the 1930s, the city, realizing that something had to be done to renew its image as America's "haven of health," made sweeping changes. Essentially, they made it illegal for anyone in Excelsior Springs but the city to sell mineral water.

Using federal Works Progress Administration (WPA) funds, the city of Excelsior Springs built their \$1 million Hall of Waters spa, supplied with the flows of four separate mineral springs. Local and exotic varieties of mineral water were dispensed at the "world's longest water bar," and, in the basement, a large sulpho-saline mineral water swimming pool was constructed. There even was a separate "polio pool," complete with wheelchair ramp. Nationally, mineral water use was once again riding a high tide of popularity. But by the 1930s, Excelsior Springs' competition in the rest of Missouri was nearly dead.



An 1885 pamphlet for the Sweet Springs Hotel in Sweet Springs advertised the mineral spring's medicinal qualities as well as the hotel's two octagonal swimming pools. Two-hundred thousand gallons of mineral water a day were pumped five miles to fill the pools. State Historical Society of Missouri photo

In 1892, however, when Paul Schweitzer completed his "Report on Mineral Waters" for the Missouri Geological Survey, forerunner of the Missouri Department of Natural Resources' Geological Survey and Resource Assessment Division, mineral water resorts were prominent features of the landscape all across the state. During the state's mineral water craze, from about 1880 to 1920, there were at least 80 establishments that could have qualified as "health resorts," offering water for both bathing and drinking "cures." What happened to these businesses? Why did they fade away? Not surprisingly, there were many interrelated factors at work in their demise, but most of them simply succumbed to the changing times. In spite of this, the pronounced popularity of mineral water resorts bears testimony to the then widespread, steadfast belief in the healing nature of their waters.

Could the waters really heal? "Scientific research has given us today a better understanding of nutrition, medicine and health," said James Vandike, a Missouri Department of Natural Resources' geologist. "Although some people would probably argue the point about the medicinal value of these mineral springs, the greatest value of the resorts was probably in providing a place where people could relax and relieve themselves of stress."

Loutre Lick, later called Mineola, was probably the first mineral spring development in Missouri that could be called a resort. Here, Daniel Boone and Thomas Hart Benton sought relief for their ailments.

Missouri's mineral water boom was not a unique occurrence. Citizens of nearly every state, at

some point in American history, "took to the waters." It began early, with several Colonial spas opening their doors before the Revolutionary War. As a colonel in the 1760s, George Washington soaked his rheumatism in the warm mineral springs at Bath, Va. This American tradition was carried over from Europe, where interest in mineral waters extended back to the ancient Greeks.

Mineral springs helped to guide America's westward expansion. Harrodsburg, Kentucky's first permanent white settlement, was founded at mineral springs. Resort touring in the invigorating climate of the Appalachians was the summertime rage in the 1830s, at least for the upper crust of society. By the 1840s, Hot Springs in Arkansas, New Baden in Indiana and Drennon Springs in Kentucky were nationally famous resorts.

Loutre Lick, later called Mineola, was probably the first mineral spring development in Missouri that could be called a resort. Here, Daniel Boone and Thomas Hart Benton sought relief for their ailments. Benton bragged of the Loutre Lick spring in the halls of Congress, where Henry Clay referred to him as the "Senator from Missouri's Bethesda."

By the 1850s, Missouri had several mineral water resorts with at least regional clienteles, including Monegaw Springs in St. Clair County, Sulphur Springs near St. Louis, Sweet Springs in Saline County, White Sulphur Springs in Benton County, Elk Lick Springs in Pike County and Choteau Springs in Cooper County.

The resort business suffered in the troubled decades immediately before and after the Civil War. But by the late 1870s there was an upturn, and by the 1880s the number of operating resorts had reached a peak. Twenty-eight new resorts opened their doors between 1881 and 1890.

Early resorts were, of necessity, founded near their mineral spring sources. But when spa developers learned that "medicinal" water also could be obtained by drilling wells into mineralized groundwater, resort locations were no longer tied to sites with natural springs. If the well turned out to be artesian, (a well with enough natural water pressure behind it for the water to discharge at the surface with noticeable vigor) there was added promotional appeal, if not enhanced medical value. Artesian well waters at Lebanon also were claimed to be "magnetic." In St. Louis, the pungent, sulpho-saline waters of an artesian well, originally drilled to supply a sugar refinery, were piped into Belcher's Bath House. This well, sunk from 1849 to 1854, was an engineering marvel for its time. It was drilled to a depth of 2,199 feet and, until 1966, was the deepest in Missouri.

Medicinal water from springs and wells also was bottled and sold. Missouri's mineral waters, natural or artificially produced, sold carbonated or "still," compared favorably with national brands. Two of Excelsior Springs' waters won blue ribbons at the 1893

Chicago World's Fair.

Claims for the healing powers of mineral waters often were highly exaggerated, but no more so than for the hundreds of patent medicines on the market at the time, servicing nearly every ailment known to mankind at a modest cost. Despite the prevalent "medicine-show" aura of advertising, belief in the medical virtues of mineral waters was not confined to the "uneducated." Many respected doctors prescribed mineral waters and prominent scientists supported their use.

Attitudes change with time. Today's bottled spring water industry relies on pleasant tasting, odor-free water to sell their products. The Missouri springs used today for bottling are almost exclusively found in the Ozarks where high-quality, moderately mineralized groundwater is easily found.

In spite of the early focus on healing, many resorts eventually leaned more toward recreational diversions and pleasure, essentially becoming tourist camps and amusement parks. Prominent examples of this were found at Montesano Park near St. Louis and Pertle Springs in Warrensburg.

Montesano, with its huge dance pavilions and thrilling "switchback" railway ride, was reached by a short steamboat jaunt down the Mississippi River from St. Louis. Pertle Springs was famous for its huge gatherings, including free-silver conventions, temperance rallies, camp meetings and Chatauquas, or "traveling colleges." Visitation to Pertle Springs and Montesano Park was so heavy on summer weekends that a special train hauled patrons from Warrensburg several times a day.

The resort and mineral water boom began to fade early in the 20th century. With the widespread adoption of filtration and disinfection of public water supplies in the first decades of that century, sales of bottled waters, including mineral waters, slumped. The pre-modern peak of bottled water sales in Missouri was just before World War I. By that time, most of the resorts already were gone. There was a flickering of hope with the discovery of radioactivity in mineral waters near the turn of the century, when some felt that a documentable accounting for hitherto unexplainable medicinal powers had finally been revealed.



The Hall of Waters in Excelsior Springs is an Art Deco masterpiece that is little changed from when it was built by the Works Projects Administration in 1938. DNR photo by Scott Myers

“Although some people would probably argue the point about the medicinal value of these mineral springs, the greatest value of the resorts was probably in providing a place where people could relax and relieve themselves of stress.”

– James Vandike, Department of Natural Resources' geologist

But the excitement would be short-lived. The mainstream medical profession, armed with the promise of new and speedy drug cures, had already turned a cold shoulder on the use of mineral water in therapeutics. Boisterous promoters, with exaggerated claims for radioactive and lithium waters, unwittingly supported passage of Pure Food and Drug Laws in 1906 that severely curtailed false advertising. In the 1910s and 1920s, many newspaper and magazine articles exposed what were considered mineral-water frauds and quacks. Soon, a public lack of confidence in the belief that any genuine medical therapy could be gained from mineral waters resulted.

Many of the mineral springs and spas were located near what geologists refer to as the "fresh water-saline water interface," a zone of mixed water types that snakes diagonally across the state. North and west of this line, deeply buried rocks contain highly mineralized groundwater. To the south and east are rocks that contain "fresher" water. The freshwater-saline water interface roughly follows the outcrop line of Pennsylvanian-age rocks composed of shale, thin limestone and sandstone and coal seams. They contain abundant organic materials. Water traverses them so slowly that it dissolves minerals in higher quantities than more permeable aquifers to the south.

Mirroring the locations of these springs, many of the state's mineral water resorts were clustered in a broad arc from Vernon and Cedar counties on the west, northward through Johnson County, then bending eastward through Saline and Howard counties toward Pike and Ralls counties on the Mississippi.





Whatever we may think today about mineral waters, we must concede that they were significant aspects of our natural resource heritage. They also were important factors in the state's economic development. Mineral water resorts could be considered, in some ways, the ancestors of modern public swimming pools, tourist camps, pleasure resorts and amusement parks. In spite of this legacy, their unique contributions to Missouri's history have been largely forgotten.

There are very few sites in Missouri where historic mineral waters can be seen flowing in a natural state. In fact, many of the state's mineral springs, even ones that were once prominent, can no longer be found. Urban development and the building of reservoirs have obliterated several famous mineral water resorts.

Some people have attributed the disappearance of mineral springs to the increased pumping of groundwater at nearby wells. However, "Most springs have shallow sources of supply, so they should be less affected by the pumping of much deeper wells," said Vandike. "Some mineral springs may have eventually become plugged by the gradual deposition of minerals at their outlets. This makes sense in many cases since historic accounts often mention that spring orifices were 'excavated,' 'developed' or 'improved' to sustain or increase flow. In addition, most of the highly mineralized springs are in areas of the state where deep groundwater is even more mineralized and is not widely used."

One place where historic springs still flow is the Blue Licks Conservation Area near Marshall, where a unique mineral spring "complex" is preserved. At Spalding Springs, Choteau Springs, McAllister Springs and Randolph Springs, in addition to mineral springs, one can see significant ruins from the bygone mineral-water era, such as weathered pagodas, crumbling swimming pools, and building foundations - remains perhaps worthy of some attempts at preservation and interpretation.

Only one mineral spa in Missouri was able to weather the ups and downs of public perception and cycles of mineral water popularity. At Excelsior Springs one can still take a hot, relaxing mineral water bath or sip waters at the "water bar." Vicki Bates is encouraged by the fact that Excelsior is enjoying a renewal of interest as a "retreat community for Kansas Citians."

But even here, the mineral waters have become a relatively minor part of the city's attraction - despite the fact that these medicinal springs gave rise to the impressive Hall of Waters, which is a lasting testimonial to the belief that nature and mineral springs can heal us.

Loring Bullard is executive director of the Watershed Committee of the Ozarks, a citizen-based advisory group established to protect the sources of public drinking water for Springfield and Greene County.

The article header is set against a background of blue, wavy, abstract lines that resemble water.

Impaired Waters

by John Madras Finding Causes, Monitoring Solutions

"There used to be fish bigger than me in this river."

"We never thought about whether the water was safe to drink."

"I remember swimming in the Granddaddy Hole and not being able to get to the bottom because it was so deep."

We have all heard comments like these. Times may have changed, but we still long for the cool, clean, safe water of our childhood. As a state, we are committed to preserving and protecting this precious natural resource. We set our expectations, see where we are and then take action to get there – and stay there. Defining these expectations is critical to addressing them. This is why technical standards must be employed. The Missouri water quality standards define our state waters and what we want them to do. They identify the level of water quality expected for those waters. They also provide a means to judge whether water quality measures up. The water quality standards include:

General Criteria: All waters are expected to meet standards called general criteria. These narrative or aesthetic criteria protect waters from odors, scum, sludge deposits and threats to public or environmental health.

Classified Waters: Waters that have perennial flow or permanent pools are classified waters and are described by the benefits they provide to society, such as drinking water, livestock watering, navigation, fishing, swimming and others.

Numeric Criteria: Classified waters are subject to specific criteria that protect these waters for their uses. These criteria define water quality in terms of maximum or

minimum amounts of physical conditions or chemicals allowed in the water.

Antidegradation: This is a set of requirements that maintains existing uses such as drinking water supply or irrigation. It allows lowering of water quality only if it is justified and maintains high water quality where warranted.

The process of updating standards is described on the Missouri Department of Natural Resources' Web site at [www.dnr.state.mo.us/deq/wpcp/wqstandards/wq_tri_process.htm], or by calling 1-800-361-4827.

Seventeen Reasons Why Some of Missouri's Waters Were Listed as Impaired in 1998

1. Acid or minerals from coal mine drainage
2. Chlordane in fish
3. Metals from hard rock mining
4. Low dissolved oxygen below dams
5. Sediment from barite mine ponds
6. Wastewater discharges
7. Low pH
8. In-stream sand and gravel mining
9. Sediment and disturbance by recreational vehicles

10. Unknown sources of toxicity
11. Bacteria and nutrients from nonpoint sources
12. Pesticides in drinking water sources
13. Taste and odor contaminants in drinking water sources
14. Metals from metal smelters
15. Habitat destroyed by channelization
16. Habitat degraded by sedimentation
17. Sedimentation from quarries

Measuring Our Waters

So who is doing the testing? Water-quality monitoring is carried out by a large number of public agencies, universities, private interests and citizen volunteers. The Missouri monitoring program includes chemical monitoring surveys for specific contaminants, monitoring for toxic constituents, biological and sediment monitoring, and fish-tissue analysis. The resulting data paint the picture of the quality of our waters.

The water quality standards provide the yardstick that is used to measure the success of Missouri's clean water laws. The department compiles water quality information continuously. We provide summary reports to the public and to the U.S. Environmental Protection Agency. Much of this information is contained in periodic reports such as the Missouri Water Ways, which can be found on the department's Web site at [www.dnr.state.mo.us].

A subset of the waters that do not meet water-quality standards are labeled as "impaired," and are identified on the Missouri Impaired Waters List, also known as the Section 303(d) list after part of the federal Clean Water Act. The list is periodically updated and lists waters where pollutants cause streams, rivers or lakes to fall short of meeting their standards. Newly discovered water-quality problems are added, while waters that meet water-quality standards or can be better managed in other ways are removed.

The waters on the impaired waters list are some of the more complex water-quality problems to solve. Many cannot be fixed by writing a permit differently or enforcing an existing permit. Some have had ongoing problems for a long time. All of them deserve, and receive, special attention from the department.

Custom-Made Solutions

The solutions to water quality problems need to fit the situations and make sense for the specific water and the people who use it. The Clean Water Act names a specific tool, known as a total maximum daily load, or TMDL, to be applied to waters on the impaired waters list. A TMDL calculates the amount of a contaminant that can be present in water while still meeting the standards. Each impaired water has its own characteristics, and each TMDL comes from data specific to that water.

Mercury – the Newest Contaminant

Most people recognize mercury as a silvery liquid that is used in thermometers and other equipment. It also is a very toxic element that causes health-related problems in humans. Consequently, mercury is being phased out of many uses. However, it continues to enter the environment through combustion processes, such as from coal-powered electric plants. Mercury accumulates in animals and can be magnified through the food chain.

In 2001, the Missouri Department of Health issued its first fish consumption advisory for mercury. Fish tissue monitoring has shown that some fish are not suitable for eating because some people are at particular risk from the health damage mercury can cause. Largemouth bass 12 inches or greater should be avoided by women

TMDLs work best when they are compatible with the local setting and the traditional methods available to local people to solve these problems. For example, a wastewater treatment plant that disinfects its wastewater with chlorine to protect public health also must remove excess chlorine before the wastewater enters a stream to protect fish. The TMDL describes the very small amount of chlorine that may remain in the wastewater, and that amount is included in the plant's permit. Similarly, lakes that are used for drinking water supplies have limits on the levels of pesticides they may hold. Department staff work with

who are pregnant or may become pregnant and children age 12 and younger. Monitoring and health advisories will continue as the department and its counterparts across the country work on solving this problem.

For more information, contact the Department of Health's Advisory Web site at [www.health.state.mo.us/NewsReleases/01fishadvstry.html].

the University of Missouri Extension Service and others to help crop producers manage pesticides for their protective qualities. Management plans are developed that act as TMDLs. This keeps the pesticides on the land where they are useful, rather than in the water, where they are pollutants.

Sustaining the Solution

Achieving a water-quality goal requires a concerted effort, often including a detailed, long-range project. Maintaining that goal, therefore, becomes even more crucial. Each TMDL includes an implementation plan that describes actions that will improve water quality. These plans can range from improving a wastewater treatment plant, to reclaiming an abandoned mine land site. Again, the solution to the impairment is individually designed for the problem. Once a problem is solved, water quality monitoring continues to ensure that water quality is maintained.

For more information, visit the following Web sites: EPA water quality standards [www.epa.gov/OST/standards], Missouri water quality standards [mosl.sos.state.mo.us/csr/10csr/10c20-7a.pdf], EPA TMDLs [www.epa.gov/owow/tmdl/index.html], and MDNR TMDLs [www.dnr.state.mo.us/deq/wpcp/wpc-tmdl.htm].

John Madras was the planning chief of the department's Water Pollution Control and is the policy director of the department's Air and Land Protection Division.



Letters

To plan our 2001 summer vacation, we first looked through the booklet on Missouri state parks and historic sites that is published by the Department of Natural Resources. We were immediately attracted to [Roaring River State Park](#) and decided to go there. It surpassed all our expectations.

While known for years to trout fishermen, it is now a park that the entire family can enjoy. In addition to trout fishing, the park offers hiking, bike riding, swimming, horseback riding, and a golf course is nearby. Each day, park staff offer several nature programs and nature hikes, as well as family entertainment during the evening.

Nestled in the Roaring River Valley that flows through the beautiful Ozark hills of southwestern Missouri, it is one of the crown jewels of the Missouri state park system. Like other state parks we have visited, it was clean and well maintained; the park employees were courteous and helpful. If your family enjoys outdoor activities and the natural beauty of our state, we recommend it highly.

W. Dudley McCarter
St. Louis

Missouri Resources speaks of water;
We, here, have it galore.
Our city was founded because of water;
They found it when they started to explore.
Then with the government's assistance,
They built a hall to pipe it to.
We started with wells everywhere,
Many – not just one or two.
Now visitors come to see us;
They drink the water while they are here.

So, come to Excelsior Springs!
Drink! Then kindly pay our cashier.

Roy Payne
Excelsior Springs

The enclosed new subscription requests are from our local GED students. I plan to use your magazine as a teaching tool for them. I doubt that most of them have received a magazine in their own names, let alone one of quality.

Thank you for making such a fine magazine available to the citizens of Missouri, one that will surely improve our environment and the quality of our lives.

Connie Hjelmeng-Johnson
Galena

Letters intended for publication should be addressed to "Letters," *Missouri Resources*, P.O. Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 751-6860, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can e-mail *Missouri Resources* staff at moresdnr@mail.dnr.state.mo.us



News Briefs

Partnership To Help Printing Industry



The Missouri Department of Natural Resources, the U.S. Environmental Protection Agency (EPA) and local St. Louis officials have endorsed a new program to improve the environment in the St. Louis region. Missouri is one of three states selected by EPA to implement this pilot project.

Printers can now participate in the Printer's Simplified Total Environmental Partnership Pilot Program - or PrintSTEP. Typically, printing companies must obtain permits for wastewater, hazardous waste, storm water and air emissions. Often, manufacturers must work with different environmental offices to obtain these permits. The PrintSTEP Pilot Program tries a different regulatory approach.

The goal of PrintSTEP is to consolidate permitting requirements into one enforceable agreement. This single agreement will improve permit consistency, reduce administrative work and promote pollution prevention.

PrintSTEP encourages pollution solutions that are good for a company's bottom line as well as for the environment. PrintSTEP also moves toward a more open process by involving neighborhoods and communities in the regulatory process. Several St. Louis area printing companies have already enrolled.

For more information, contact Bill Hernlund of the department's St. Louis Regional Office at (314) 301-7682.

Young Retires From Department

Director of the Missouri Department of Natural Resources' [Air and Land Protection Division](#), John A. Young, announced his retirement, effective March 1, 2002.

Young, 52, said he is retiring to spend more time with his family. In his letter of resignation, he told department director, Stephen Mahfood, "The decision to leave the Department of Natural Resources after 28 years is not an easy one, but I feel this is a unique opportunity to spend more time with my family."

Mahfood accepted Young's decision with regret. "John has been a central figure in protecting and improving Missouri's natural resources for nearly three decades," Mahfood said. "We are saddened by his departure, but we respect his decision," he added.

Young was appointed director of the department's Air and Land Protection Division in August 2001. The division is responsible for protecting the environment, public health and the economic well-being of Missourians by preserving and improving the quality of the state's air and land, and by encouraging wise management of Missouri's natural resources.

Prior to his appointment as director of this new division, Young served as director of the Division of Environmental Quality for 8 1/2 years and as deputy director of the Division of Environmental Quality for 7 1/2 years. Young has held various other positions within the division's Water Pollution Control Program, Land Reclamation Program and the Kansas City Regional Office.

Young has served on numerous national and state environmental committees and task forces. Among his recognition and awards is an award from the FBI for criminal investigators efforts. Young also received the Air Conservationist of the Year award from the Missouri Conservation Federation for his leadership in the cleanup of Times Beach.

Department Joins Earth Day Events



The Department of Natural Resources will continue its affiliation with several Earth Day 2002 events across the state this spring. The sixth annual Earth Day at the Capitol event in Jefferson City is scheduled for Friday, April 19. Additional information is available on our Web site at [www.dnr.state.mo.us/earthday/]. In addition, the St. Louis Earth Day Festival will be held on Sunday, April 21 from 10:30 a.m. until 7:00 p.m. at the World's Fair Pavilion in Forest Park.

Native-American storytelling and shows by the World Bird Sanctuary will be sponsored by the department. There will be a children's display area, new age, soul and rock music, water exploration tent, mini-boat regatta, All-Species Parade, children's rock garden of peace, earth labyrinth and even valet parking for those who ride their bikes to the event.

Food and refreshments will be available and can and bottle recycling service will be provided by the City of St. Louis Refuse Division. The Missouri Department of Conservation will sponsor a tree seedling giveaway and several other events are on the day's agenda.

The following day, Monday, April 22, the St. Louis Earth Day Festival will hold a public symposium entitled, Connecting Our Communities Through Watershed Planning, at the Missouri History Museum. Speakers include David Hammer, University Missouri-Columbia, who will discuss watershed science. The keynote speaker will be Robert Archibald, president of the Missouri Historical Society.

John Hoal of Washington University and Diana Sheridan of the James River Basin Partnership also will speak.

The symposium, co-sponsored by the [Department of Natural Resources](#), AmerenUE and other partners, will offer three workshops focusing on improving St. Louis area rivers, streams and lakes through watershed activities. These workshops will give participants input into the St. Louis Riverfront Plan, a look at the mechanics of watershed planning and plans to address funding opportunities. Presenters will share examples of successful watershed committee projects and explore ways that healthy rivers help create and sustain healthy communities.

For more information, call (314) 962-5838, or e-mail [earthdaystl@aol.com].

The department also will be joining with other Earth Day events in Springfield, Kansas City and Missouri state parks.

Hog Producer Reaches Settlement in Pollution Suits



The U.S. Environmental Protection Agency (EPA) and the Justice Department announced that Premium Standard Farms (PSF) and Continental Grain Co., which comprise the second largest producer of hogs in the United States, have entered into a settlement to resolve environmental violations at the companies' large-scale farms, known as concentrated animal feeding operations (CAFOs).

The settlement was reached with the United States and the Citizens Legal Environmental Action Network (CLEAN), a citizens group. PSF and Continental have agreed to pay a \$350,000 civil penalty in addition to the \$650,000 previously paid to the state of Missouri. As much as \$50 million may be required to develop and install cleaner wastewater treatment technologies never before used in these operations.

PSF's and Continental's operations in Missouri consist of more than 1,000 hog barns, 163 animal waste lagoons and 1.25 million pigs primarily located on 21 farms in five counties. The settlement seeks significant reduction of odorous and potentially harmful air pollutants from their facilities and the prevention of waste spills that can result in fish kills or other harm to local rivers and streams.

For more information, call the department's [Water Pollution Control Program](#) at 1-800-361-4827 or (573) 751-1300.

Lewis and Clark Workshop Planned



Communities and groups interested in participating in activities surrounding the Lewis and Clark Commemoration will have a chance to learn more about it at a community workshop this spring.

The Missouri Lewis and Clark Bicentennial Commission has scheduled the community workshop for May 7 in Cape Girardeau.

The commission was developed to coordinate activities in commemoration of the 200th anniversary of the Lewis and Clark Corps of Discovery, which will take place in 2004 to 2006. Local involvement in the commemoration is being encouraged and this workshop will give participants information about national and state initiatives as well as ways they can become involved.

This is the third in a series of free workshops for communities. Subsequent workshops will be held in other areas of the state. For more information about the workshops, contact the commission at (573) 522-9019, e-mail them at lewisandclark@mail.dnr.state.mo.us or visit the Web at [\[www.lewisandclark.state.mo.us\]](http://www.lewisandclark.state.mo.us) which will have the latest information as it is available.

Geologist Groups Meet In St. Louis

That geology is central to society's needs was the theme of the 44th annual meeting of the Association of Engineering Geologists (AEG), and the 38th annual meeting of the American Institute of Professional Geologists (AIPG). The groups met in St. Louis last fall for their first joint assembly ever.

The meeting was planned and organized by members of the St. Louis section of AEG and the Missouri section of the AIPG. Exhibitors included the Illinois State Geological Survey, the U.S. Geological Survey, and the Missouri Department of Natural Resources' Geological Survey and Resource Assessment Division (GSRAD).

Hundreds of professional geologists from across the United States and several foreign countries presented professional papers and attended training and educational field trips.

Missouri State Geologist Mimi Garstang, director of GSRAD, welcomed the groups to Missouri. Members of her staff moderated various symposiums and other staff led field trips that highlighted the state's wide variety of geologic resources.

Voluntary Cleanup Program Issues 100th Clean Letter



The Department of Natural Resources' [Voluntary Cleanup Program](#) issued its 100th Certification of Completion or "No Further Action Letter" in September 2001. One hundred contaminated properties across Missouri have been voluntarily remediated under the program since its inception in 1995 and no longer pose a significant risk to human health or the environment.

The department has participated in the investigation and cleanup of a variety of sites. Causes of contamination include leaking chemical storage tanks, spills, poor housekeeping, historic disposal of industrial wastes, lead paint, asbestos and contaminated fill dirt. A few sites were known to the department prior to their entry into the program - most were not. Currently, the program has approximately 150 active sites.

The Voluntary Cleanup Program is open to any site meeting eligibility criteria. A property must have known or suspected contamination by a hazardous substance and must not be the subject of any ongoing enforcement actions, a regulated petroleum storage tank site or eligible for Petroleum Storage Tank Insurance Funds, under evaluation for Superfund action, or be a Resource Conservation and Recovery Act site.

For more information, call the department's [Hazardous Waste Program](#) at

1-800-361-4827 or (573) 526-8913.

Billion Dollar Boost



Historic preservation boosts Missouri's economy by slightly more than \$1 billion annually, according to a study recently completed by Rutgers University.

The department's [State Historic Preservation Office](#) and the Missouri Downtown Association provided oversight and funding for the study. This total includes \$346 million in historic rehabilitation spending, \$660 million in heritage tourism spending and about \$5 million in net Main Street Program activity. The study analyzed the combined economic impact of the rehabilitation of historic structures, heritage tourism, Missouri's Main Street Program and the historic rehabilitation tax credit program.

Rutgers' Center for Urban Policy Research conducted the study. The National Park Service and U.S. Department of the Interior also provided funding for the study.

"This study confirms that historic preservation in Missouri is important, culturally and aesthetically," said Gov. Bob Holden. "The Rutgers University study demonstrates that historic preservation also fosters significant economic activity and benefits in its own right."

The estimated \$346 million spent on rehabilitating historic buildings in Missouri in 2000 resulted in 8,060 jobs, \$249 million in income, \$332 million in gross state product, \$70 million in taxes and \$292 million in in-state wealth.

"The State of Missouri offers one of the nation's most successful programs to foster historic rehabilitation through the state's [Historic Preservation Tax Credit Program](#)," said Department of Natural Resources' Director Steve Mahfood. "Historic preservation tax credits have done exactly what they were meant to do. They encourage the investment of private capital in an area broadly recognized as being in the public good."

"The Rutgers study shows that the economic gains from activity supported by the Missouri Historic Preservation Tax Credit offset most of the state cost of this program."

"The Historic Preservation Tax Credit Program has been very successful in stimulating investment in the rehabilitation of historic properties as well

as contributing to the economic revitalization of some distressed areas in Missouri," according to Mahfood, who also serves as the state historic preservation officer.

From the beginning of tax credit program activity in 1999 until August of 2001, \$295 million of historic rehabilitation had cumulatively been effected under this program.

"The Rutgers economic analysis of Missouri's Historic Preservation Tax Credit Program shows that when the economic activity and the ensuing tax payments fostered by the rehabilitation tax credit program are considered, the magnitude of tax payments are such that there is negligible net cost to the Missouri taxpayer," said Mahfood. "Moreover, significantly more income and wealth is generated."

As an industry, Missouri tourism is one of the state's top three revenue producers. Missouri is rich in historic and other interesting sites that are core motivations for heritage travel. The Rutgers study shows that expenditures of Missouri heritage travelers, counting only the spending attributable to the heritage portion of their travels, amount to \$660 million annually. This \$660 million in annual Missouri heritage travel spending equals 20,077 jobs; \$325 million in income; \$574 million in gross state product; \$147 million in taxes, including \$79 million in state and local taxes; and annual in-state wealth creation of about \$506 million.

Another important component of the study was Missouri's Main Street Program, which was developed to help revitalize the state's downtowns. The average annual Missouri Main Street investment is roughly \$5.4 million of construction plus retail jobs. This results in in-state wealth creation of \$10 million.

"We have always believed that preservation of Missouri's historic resources has a significant economic impact. Now the Rutgers study provides comprehensive documentation to support such assumptions," said Claire Blackwell, deputy state historic preservation officer.

Co-authors of the study, Rutgers' professor David Listokin and Michael Lahr, were the keynote speakers at the Missouri Downtown Association's winter workshop, "Heritage and Community in Missouri," Feb. 1 and 2, in Hermann. For more information about the workshop or the economic study, call the association at (314) 436-6500 or the department's State Historic Preservation Office at (573) 751-7860.

The department plans to publish a summary of the 200-page study later in the year; copies of the summary will be available for a nominal charge at that time. If you would like to receive notification of the publication's

availability, please call the department's [State Historic Preservation Office](#) at (573) 751-7860.

Industrial Minerals Subject Of Forum

The 38th Forum on the Geology of Industrial Minerals will be held in St. Louis, Missouri, April 28 to May 3, 2002. Geologists from the Missouri Department of Natural Resources' Geological Survey and Resource Assessment Division (GSRAD) are helping to plan the forum.

Cement and lime resources mining and technology, the underground mining of aggregate, the reuse of underground mined space, the transportation of industrial minerals, the mining of rare earth element resources, mining and technology, and waste materials as industrial minerals are session themes.

There will be field trips to construction aggregate sites in St. Louis and cement, lime and other industrial mineral facilities in southeast Missouri and southern Illinois; to underground storage areas in southwestern Missouri; and to sites where igneous rocks and refractory clays are mined. This will give the audience an opportunity to see examples of industrial mineral activities in the Midwest.

Posters on scientific and technical subjects related to geology, mining and the processing of industrial minerals will be featured at the forum.

For more information call (573) 368-2139 or e-mail [nrruefa@mail.dnr.state.mo.us], or visit the following Web site: [www.industrialmineralsforum.org].



One Last Word



Are You Up to the Challenge?

by David Goggins
photograph by Scott Myers

What do Alliance Water Resources, Target Stores, Lake City Army Ammunition Plant, and Reeds Spring High School have in common? They are all recipients of the Missouri Governor's Environmental Excellence and Pollution Prevention Award for 2001.

This prestigious awards program was initiated in 1993 and has recognized industries, businesses, non-profit organizations, municipalities and others for their contributions to improving the state's environment.

The Governor's Environmental Excellence and Pollution Prevention Awards are given in several areas of environmental achievement including, land use, market development, water conservation, outreach and education, technical assistance, recycling and pollution prevention.

The program is jointly sponsored by the Missouri Department of Natural Resources, the Missouri Chamber of Commerce and the Kansas City-based Bridging the Gap. Competition for the awards begins each spring with applications submitted to one of the sponsoring agencies. The applications are evaluated by a panel of judges representing the Governor's Office, an industry representative and the sponsoring groups. The judge's scores are compiled and recommendations made to the governor, who makes the final selection.

The winning applicants are recognized at the Missouri Chamber's Environmental Conference held each July at the Lake of the Ozarks. The governor presents the awards, either as part of the conference or in a special ceremony in the Governor's Office.

Many worthwhile projects are reviewed each year, and the awards have recognized businesses that range from a "mom and pop" flower shop to General Motors and Anheuser-Busch. Civic organizations and government bodies have received the awards as well.

Award winners are self-nominating, and any Missouri business, municipality, organization or school is eligible. The program or project must have been implemented in Missouri in the past three years. Prior applicants are encouraged to apply again as long as they still meet the timeframe.

Applications for this year's awards program are due by May 17. The award recipients will be announced at the Missouri Chamber of Commerce's Environmental Conference, July 24-26, 2002.

If you or your organization have a project or program that you think qualifies for the Governor's Environmental Excellence and Pollution Prevention Awards, please contact the Missouri Department of Natural Resources Pollution Prevention Unit at 1-800-361-4827, or the Missouri Chamber of Commerce by calling (573) 634-3511. You also can download and print the application form (not an online application) from the department's pollution prevention Web site at [www.dnr.state.mo.us/deq/tap/polprev.htm].

David Goggins serves as pollution prevention coordinator through the department's Outreach and Assistance Center.



Darrell Sigwerth, manager of the Jefferson City Target Store, accepted a 2001 Governor's Pollution Prevention Award in recognition of Target Corp.'s recycling efforts. Target staff eliminate trash before it reaches the store by working closely with vendors to reduce product packaging.

RECYCLING ECONOMICS\$

MARKET FLOURISHES DURING LEAN TIMES

by Kristin Allan

photographs by Scott Myers



A department market development grant helped Rick and Joni Loganbill of Versailles expand their business, Loganbill Shavings, with the purchase of a chipper that they use to turn waste from their wood shavings business into wood mulch.

"Save a tree," you think to yourself as you toss the Sunday paper into the recycling bin. "Save another," you vow as you check to make sure the greeting cards you purchase have recycled content. Recycling is not difficult, but it does sometimes require a little extra effort, which you are more than willing to make. After all, recycling protects the environment – right?

The environmental impetus for recycling is increasingly timely. Recycling and reusing reduce pollution,

conserve natural resources, save energy, reduce greenhouse gas emissions and lessen reliance on landfills for disposal. The environmental benefits of recycling are well established. A new study, however, confirms that the "green" in recycling may have as much to do with the stuff in our wallets as it does the stuff in our environment.

The U.S. Recycling Economic Information (REI) Study is a landmark national study that documents the importance of recycling and reuse in the U.S. economy. The report was commissioned by the U.S. Environmental Protection Agency and several states through a cooperative agreement with the National Recycling Coalition. It clearly shows that recycling and reuse activities are a significant force in the U.S. economy and make a vital contribution to job creation and economic development.

Through the Environmental Improvement and Energy Resources Authority's (EIERA) Market Development Program and its partnership with Missouri Enterprise, Missouri data was included in the aggregate results of the national study released in November 2001. The national study is important to the EIERA because the Market Development Program promotes recycling by focusing on economic development. "Recycling market development is a win-win endeavor," says Chuck Banks, EIERA board chairman. "It provides business opportunity for Missouri entrepreneurs, creates jobs and helps protect our environment at the same time."

The U.S. REI Study involved a comprehensive analysis of both existing economic data and reasonable estimates based on targeted surveys of recycling businesses and sophisticated economic modeling. The study measured several industry characteristics, including the number of recycling establishments, total jobs, annual payroll, annual receipts and the amount of materials collected and processed. Using the best available data from 1997-1999, the study evaluated information from 26 different types of reuse and recycling establishments and calculated both direct and indirect economic impacts.

The study's conclusions are impressive. The U.S. recycling and reuse industry involves more than 56,000 establishments that gross more than \$236 billion in annual revenues and employ more than 1.1 million people with an annual payroll of \$37 billion. These numbers compare favorably with other industries, such as automobile manufacturing and mining. The average wage for recycling employees is \$36,000, about \$3,000 above the national average.

The study also calculated the indirect economic impacts of the recycling industry. Businesses that support recycling and reuse establishments, such as equipment manufacturers and accounting or engineering firms, receive an economic boost from the industry. Through indirect recycling impacts, an estimated 1.4 million jobs are supported by the recycling industry with an annual payroll of \$52 billion and an estimated \$173 billion in receipts. Recycling and reuse industry employees also support economic activity when they spend their paychecks, supporting an estimated 1.5 million jobs with a payroll of \$41 billion and gross receipts of \$146 billion. The recycling and reuse industry also generates approximately \$12.9 billion in federal, state and local tax revenues.

Four major manufacturing industries account for more than half of the economic activity of the industry:

paper mills, steel mills, plastics converters and iron and steel foundries. Recycling, however, is a diverse industry and includes public sector institutions as well as private businesses. From curbside collection of household recyclables through the brokering or processing of recovered materials to the manufacture of recycled-content products, traditional firms and innovative market sectors support the industry.



Loganbill recycles scrap lumber purchased from sawmills throughout Missouri.

In Missouri, as elsewhere in the nation, the recycling and reuse industry is an integrated network of public and private sectors working together to recover materials once considered waste and converting them to marketable products. Supplies of materials from local collection programs have spurred many businesses to develop cutting-edge technologies and products. Barbara Lucks, materials and education coordinator for the City of Springfield, points out that a local newspaper collection program helped attract a large manufacturing operation to Springfield. Canbrands Products Division of Ralston Purina manufactures cat and dog litter from recovered material at its Springfield plant. "It is estimated the location of Canbrands in Springfield makes an economic impact of more than \$5 million annually to our community," Lucks said.

Local collection programs play an important role in recycling economics. While many waste materials are recyclable, their quantities are dispersed across household, business and industry waste streams. Improving opportunities to separate and collect recyclables has been an important first step toward integrating recycling into the lives of Missourians.

But recycling does not really occur until collected recyclable materials are returned to the economic mainstream in products people buy and use. In 1990, the Missouri general assembly authorized EIERA to create the Market Development Program to help ensure that materials collected are used by manufacturers as feedstocks for products. By converting waste into valuable raw materials, recycling creates jobs, builds competitive manufacturing industries and adds value to Missouri's economy.

Recycling is working in Missouri, and public and private partnerships such as those encouraged by the EIERA's Market Development Program are working as well. For example, the Market Development Program's \$435,000 investment in recycling economic development during fiscal year 2001 helped to leverage \$3.5 million in total investment. This investment created 44 full-time Missouri jobs and diverts more than 15,000 tons annually from Missouri landfills. Once the nine projects are complete, total

estimated annual gross receipts for the businesses assisted will exceed \$12 million. The avoided disposal costs for the materials used in these projects combines to total over \$450,000 each year.

In Missouri, innovative businesses are using a variety of recovered materials to make all sorts of everyday and novelty products. Using recovered materials enables Bryant Plastics, a specialty PVC pipe manufacturer located in Gainesville, to produce high-quality PVC pipe products and sell them at competitive prices. Ralph Brown, president of Bryant Plastics, said, "Using recovered materials lets us get into markets we wouldn't have access to otherwise." With customers in 17 states, the firm often operates three manufacturing lines with 25 employees.

While recycling is strong in Missouri and in the nation, the recycling industry still faces many challenges. Recycling market prices rise and fall in response to many factors that are difficult to manage on a local level. Low-cost manufacturing materials imported into the United States, global economic downturns and inexpensive disposal rates can impact the cost of recyclable commodities and, therefore, the industry. Many recycling businesses still face significant hurdles when trying to secure financing from the investment community. Many resources still are being thrown away instead of recovered for recycling, and recycled-content products continue to struggle for prominence in marketplaces.

Recycling, however, is a growth industry with many business opportunities. During the past decade, local, state and national programs have worked together to reduce waste and increase recycling. Many Missouri citizens and businesses already have made recycling a part of daily life.

In fact, Missouri is currently diverting 38 percent of waste from its landfills. As this scale of recovery grows, the cost competitiveness of recycled materials as a substitute for virgin materials will improve.

Recycling provides a myriad of opportunities for creating and retaining jobs, for encouraging new enterprise and for increasing the competitiveness of existing enterprise.

Dennis Siders of Midwest Assistance Program Inc., conducted the Missouri Solid Waste Composition Study through a 1999 Missouri Department of Natural Resources waste reduction and recycling grant. Siders observed several potential recycling opportunities in his examination of landfills and transfer stations throughout Missouri. "The most easily recyclable component would be commercial cardboard. About 118,000 tons of commercial cardboard are put in Missouri landfills each year," Siders said.



Loganbill grinds scraps left over from their wood shaving production into mulch that is dyed a variety of colors.

The EIERA Market Development Program encourages the recovery of cardboard by assisting in recovery efforts such as those of Mountain Ridge Recycling in Noel and Green Farm Pilot Project in Knob Noster. Both businesses use recovered cardboard in the production of soil-enhancing compost mixes. Paper products, however, still dominate waste streams. Siders' study concluded that paper products amount to over a quarter of the material in Missouri's landfills. Entrepreneurs who develop viable products from mixed-paper feedstock can take advantage of this high-volume waste stream.

The Recycling Economic Impact Study shows that recycling is an established industry with a proven track record and a bright outlook. Advances in technologies are opening new doors for manufacturers and purchasers of recycled-content products. The investments Missouri businesses have made in recycling are paying off in lower emissions, greater

efficiency, less reliance on imported materials, new jobs and, in many cases, greater profitability.

As the REI Study clearly demonstrates, recycling is not simply about protecting the environment, it also is about sound economics.

Kristin Allan is program manager of the Missouri Market Development Program within the department's [Environmental Improvement and Energy Resources Authority](#).

Resource Honor Roll



Neil S. Andre

St. Louis' Earth Angels Celebrate 15 Years

Few organizations live up to their name as well as the Earth Angels of St. Louis. Founded by Neil Andre, this youth-based non-profit group has accomplished more in its 15-year existence than would seem possible in a lifetime. The success of these seven to 12-year-old environmental whiz kids compares favorably to organizations with ten times their mere 170 members. What these inner-city youngsters lack in fancy equipment, they make up for with shovels and mulch. Too busy to see themselves as "at risk," they have an environment to save.

The Earth Angels are well known for their neighborhood cleanups and recycling projects around St. Louis. Rather than donate all of the money from their sales, raffles, and recycling projects, they often invest some of it back into a project. More than two tons of recycled cans in 2000 alone helped sustain important and meaningful efforts like the Forest of Life in Forest Park. There, the Earth Angels buy trees and plant one for every child in the city who has died by violence. Over 150 trees costing as much as \$75 each have been planted since the project started nine years ago.

Besides creating 10 inner-city wildlife habitats, they also sponsor projects such as building and placing endangered bat boxes and cavity-nesting bird boxes, donating money to food pantries, creating a prairie ecosystem and butterfly habitat, creating displays, purchasing and installing compact fluorescent lights, sponsoring rain forests and even sending solar cookers to refugees to help reduce greenhouse gases. The Earth Angels even send kids more disadvantaged than they to environmental summer camps.

According to Andre, the group reached outside the city limits last fall. They will be finishing a wetlands rehabilitation project started last fall in the Ruth Woods Forest in University City. Coaxed outside the city to help to save an area choked by invasive

exotic vines, Andre expects the restoration to be complete by this fall.

The Angels have garnered many local awards from the mayor, aldermen and others. But the recognition does not stop there. The group has been honored in the U.S. Senate on two occasions. In 1998, Interior Secretary Bruce Babbitt recognized them. In 1999 they received the President's Youth Environmental Award. Other national environmental groups too numerous to mention have saluted the Earth Angels, and they are proud of their five-page pictorial in the Audubon Society's national magazine.

"It's not the number of environmental awards that The Earth Angels have received that impresses me, but all of the work they have done to receive them," said Neil Andre.

Not that Andre's Angels seem to need any help, but nationally, more than 1,300 adults in the U.S. and eight foreign countries have pledged varying amounts of money – many as little as \$10 – to become lifetime members and help keep the Angels flying. Andre considers himself among those members. "After all the Earth Angels have given to the earth and to people, I owe them the very best I have to offer for as long as I am able, he said. For more information or to contribute, contact the Earth Angels at P.O. Box 2055, St. Louis, MO 63158, or send an e-mail to [tambo@aol.com].



Nathan White, Kristen Durham, Eric Beckemeier and Ian Davidson of Norborne High School

Norborne High School Wins 2001 Envirothon

As Booker T. Washington once said, "Nothing ever comes to one, that is worth having, except as a result of hard work." The Norborne High School 2001 State Envirothon champions would agree. From a high school that has only 60 people in the entire student body, these students know that hard work and determination do pay off. The group is composed of Kristen Durham, Nathan White, Patrick Cunningham, Eric Beckemeier and Ian

Davidson. Their school advisor is Susie Franklin. Having competed in previous competitions at the regional and state levels, the team brought a great deal of experience that ultimately made the difference.

Started in 1979 as a state competition in Pennsylvania, the contest's popularity spread and by 1988, the first national event was held. Missouri held its first state competition 10 years later and now has seven regional competitions. Five-student teams test their knowledge of their state's natural resources: soils, forestry, wildlife, aquatics and a current conservation issue. The competition requires the teams to visit five in-the-field test stations where written and hands-on problem-solving skills are

required. Judges listen to an oral presentation by the teams that addresses the selected issue.

Norborne began the journey to the international competition by placing first in the northwest regional event and first in the state competition last May. From there, they attended the Canon Envirothon at Raymond, Miss., where they placed 25th out of 49 teams.

As student competitors apply the basic principles of resource management and ecology, critical thinking and cooperative problem-solving skills are fostered and enhanced. This encourages and assists future comprehension of the complex balance between our quality of life, and the quality of our environment.

Canon USA Inc. is the national sponsor of Envirothon. The state events are sponsored by the Missouri Association of Soil and Water Conservation Districts, the Missouri Department of Natural Resources, Department of Conservation, Conservation Federation in partnership with the Natural Resources Conservation Service, and the University of Missouri Extension.



Resources to Explore



Editor's Note: This is the first of four articles to appear in *Missouri Resources* in recognition of the 25th anniversary of the Missouri Natural Areas Program. The program is a cooperative effort by state and federal agencies, conservation organizations, local governments, corporations and private citizens to protect some of the state's best examples of natural communities. The program is jointly administered by the Missouri Department of Natural Resources and the Missouri Department of Conservation with representation by the U.S. Forest Service and the National Park Service.

Today, the Missouri Natural Areas Program includes 178 natural areas totaling 56,861 acres. Thirty-nine areas totaling 16,600 acres are located in Missouri state parks.

Imagine standing in a place that was once a chain of islands in a vast prehistoric ocean. Explore a rugged wilderness as early settlers did, with curiosity and caution. Experience a diverse landscape dedicated to the preservation of plants and animals unique to the Ozarks. You can do it all in the St. Francois Mountains Natural Area. The trails at [Taum Sauk Mountain State Park](#) are your doorway to this exciting outdoor adventure.

In 1996, the Missouri Natural Areas Committee designated nearly all of Taum Sauk Mountain State Park and Proffit Mountain Conservation Area, and a portion of [Johnson's Shut-Ins State Park](#) as the St. Francois Mountains Natural Area. The natural area, which is significant for its size, abundance of native plants and animals and quality of its ecosystems, is the largest in the state at 7,028 acres. Together, the Missouri Department of Natural Resources, which operates the parks, and the Missouri Department of Conservation, which operates the conservation area, ensure that this area remains a place of special beauty and significance.

Located in the heart of the rugged St. Francois Mountains in southeast Missouri, the area includes Taum Sauk Mountain, the highest point in the state at 1,772 feet above sea level; Mina Sauk Falls, the state's highest waterfall at 132 feet; and Taum Sauk Valley, the state's deepest valley. Flowing through the valley is Taum Sauk Creek, a pristine headwater stream of such high quality that it has been designated an Outstanding State Resource Water. The area incorporates parts of seven volcanic knobs and other geologic wonders like Devil's Gate and Devil's Wall. Several of the large igneous domes contain desertlike glades and pine and oak woodlands recognized as the most biologically diverse throughout their range in the 5,000-square-mile St. Francois Mountains.

The natural area has a mosaic of habitats that support many different animals, from the Big River crayfish, a restricted Ozark endemic species, to birds such as the Kentucky warbler (forest interior), whippoorwill (open oak woodlands) and Louisiana waterthrush (forested streams). These species show evidence of declining numbers, underscoring the need to protect and maintain preferred habitats.



Much of the three-mile loop of the Mina Sauk Falls Trail passes over rugged outcrops of pink and red rhyolite, providing spectacular views of the St. Francois Mountains. DNR photo by Ken McCarty

The origin of the St. Francois Mountains can be traced back 1.5 billion years when the area was a volcanic island chain in a warm tropical ocean. Explosive volcanic eruptions resulted in the formation of a landscape of seething volcanoes and calderas, formed when a huge volcano collapses into itself creating a large craterlike valley. This terrain, which underlies most of southeast Missouri, is exposed in the St. Francois Mountains.

Evidence of intense volcanic activity can be seen in the pink or reddish rocks, called rhyolite that dominates the surface. Some of the rhyolite formed when molten lava exploded so forcibly that it was ejected as small droplets that hardened into ash. The

lava cooled quickly, resulting in a fine-grained erosion-resistant rock visitors can see in the park.

Underlying the visible rhyolite is granite, the dominant but mostly hidden rock type in the St. Francois Mountains. Granite solidified slowly in place, producing a coarse-grained rock that weathers more easily. Over a billion years of erosion resulted in the current landscape where granite bedrock occupies the lowlands and rhyolite the uplands. Exposed granite can be seen at nearby [Elephant Rocks State Park](#).

The underlying volcanic terrain forms the geologic core of what we know as the Ozark Highlands. This landform, which extends from southern Missouri into Arkansas and Oklahoma developed into the current landform only 250,000 years ago, considered recent in terms of geologic time. It formed as a result of numerous major continent-building processes, including the shift of continental plates, uplift and erosion, inundation by shallow seas that deposited sedimentary rock and subsequent uplift and erosion.

Because of the shallow unproductive soils and rugged terrain, the St. Francois Mountains were barely affected by settlement. Beginning in the early 1800s, the area was sparsely occupied by hunters and farmers who ran hogs, sheep and cattle on the open range. Overgrazing resulted in soil loss, affecting the composition and pattern of vegetation. As a result, some of the open rocky glades are currently in a degraded condition, lacking many typical native plants and animals. Also, stumps of shortleaf pine trees remain from old logging days. Over the years, due to the exclusion of fire, trees, saplings and shrubs have increased in dominance, suppressing ground-layer vegetation, which supports almost 80 percent of the total native species.

One of the missions of the state park system and a goal confirmed by the designation of a natural area is to preserve and interpret significant remnants of biological heritage. This is very evident in the St. Francois Mountains Natural Area, where resource managers are working to restore native ecosystems. Prescribed burns are the primary management tool. Large burn units are designed up to 1,200 acres in size so that the lay of the land rather than the design of the unit influences burn effects. Conducted under moderate conditions, prescribed burns do not affect all areas, leaving a patchwork of unburned areas that provide safe refuges for fauna.

The results of management have been dramatic. After prescribed burns were conducted in the winter of 1992, populations of the globally imperiled Mead's milkweed were found on igneous glades within Taum Sauk Mountain State Park. These populations are recognized as significant for the preservation of the species.

Native species such as Chrysomelidae, or leaf beetles, comprise a group of insects that are exclusively plant-eaters. Doug LeDoux, entomologist with Enns Entomology Museum at the University of Missouri, has been researching these beetles for several years. Sixty-five species have been identified within the natural area. Some favor native grasses, some prefer wildflower habitat.



There is a rich diversity of plants and animals in the St. Francois Mountains Nature Area, including 65 species of leaf beetles.
Photo by Doug LeDoux

This has important implications for management. Late summer or fall burns stimulate native wildflower development whereas winter or spring burns favor native grasses. Since restoration should accommodate all species, long-range management plans need to include burns at both times of the year.

A good way to see the natural area and the park is to walk the trails. A rugged three-mile trail takes hikers from the highest point on Taum Sauk Mountain down to Mina Sauk Falls and back again. The hike

showcases the mosaic of natural communities including woodlands and sunlit glades that are more open and luxuriant because of prescribed burns. Underneath white oak, post oak and pine, a variety of native grasses, sedges and wildflowers can be observed including dwarf spiderwort, sand coreopsis, cream wild indigo, ashy sunflower, goat's rue, wild hyacinth, prairie phlox, Indian physic and prairie parsley.

For hikers looking for a more extensive experience, the 33-mile Taum Sauk Section of the Ozark Trail also travels through much of the natural area. From Taum Sauk Mountain State Park, the Ozark Trail continues a total of 12.8 miles to Johnson's Shut-Ins State Park, providing an up-close look at what makes this area so special.

The designation of the St. Francois Mountains Natural Areas reconfirms what many suspected – that the area is a resource of statewide and national significance. Natural area designation means that through research and management, these resources will be preserved for generations to come.

For more information on natural areas in Missouri state parks, or a copy of our free Natural Areas Directory, call the Missouri Department of Natural Resources toll free at 1-800-334-6946 (voice) or 1-800-379-2419 (TDD).

Mike Currier is natural resource steward for the Department of Natural Resources' Division of State Parks.



Teacher's Notebook



Coal Cookies

A Limited Resource

by Bryan Hopkins
photographs by Scott Myers

Humans first began to manipulate existing energy sources thousands of years ago, learning to control food supplies through agricultural practices. Just 300 to 400 years ago humans still met their energy needs using mostly renewable energy sources such as wood for heat, water mills for grinding crops and wind for propelling sailing vessels.

With the advent of the modern industrial age, we now depend on having easy access to complex forms of energy on a daily basis. The majority of the energy we use today is provided by nonrenewable sources such as petroleum, natural gas and coal. Of all these fossil fuels, coal is by far the most abundant. Coal is widely distributed on earth with significant variations in quality and accessibility. Historically, coal has been used to power steamships and railroad engines, to heat homes and for steel production. The primary use for coal today is in the generation of electric power. Missouri generates over 80 percent of its electricity using coal-fired power plants.

Unfortunately, coal generates some negative environmental impacts. Coal mining disturbs the land and burning it produces air pollutants that contribute to mercury contamination, smog, global climate change and other environmental problems. The use of high-sulfur

Nonrenewable Energy Sources:

Energy sources based on limited reserves created several hundred million years ago by unique geological and physical conditions. The most common of these types of fuels are often referred to as fossil fuels and include petroleum, coal and natural gas.

Renewable Energy Sources:

Energy sources based on natural cycles that are replenished in a relatively short time frame. Examples include geothermal energy, solar energy, biomass energy, wind energy and hydropower.

coal deposits are especially problematic and have been linked to acid rain. Missouri does have large deposits of coal; however, the high sulfur content currently limits its use as an energy source.

Estimating the exact amount of coal available and how long such reserves will last is difficult. Factors such as the current rates of consumption, the expense of mining in remote areas, and increasing environmental costs all must be considered. Although fossil fuels will continue to be used at some level, more of our energy in the future will need to be provided in ways that are renewable with less impact on the environment.

Activity Summary

Students will “mine” a cookie for “coal” (chocolate chips) and compare the estimated amount of chocolate chip reserves with the actual amount recovered. The activity is designed to help students experience the limited nature of nonrenewable fuel resources and issues such as predicting how long fossil fuel resources will last.

Materials

Per student:

Chocolate chip cookies
Paper clip
Paper towel
Small paper drinking cup
Notebook paper

Procedure

Set the stage by asking the students the following questions:

- How long will our current supplies of coal last?
- What are some alternative sources of energy to fossil fuels?
- Review with the class the basic concepts of nonrenewable and renewable energy sources.

Mining the Cookie for Coal (Chocolate Chips)



(Inset) "Mined" coal, like these chips, requires considerable effort to remove from the earth. Minimizing the damage lessens the environmental impact of its extraction.

Each student is given a paper towel, a chocolate chip cookie, a paper cup and a paper clip.

Instruct the students to perform all their "mining operations" on top of the paper towel (to contain the "mining wastes").

Each student should first draw on a sheet of notebook paper an area the size they estimate will approximate the number of "mined" chips from their cookies.

Have the students straighten a paper clip and begin to mine their cookie for chocolate chips.

As the chocolate pieces are separated, they should be placed in the paper cup.

Once the students have mined all the chocolate they can from their cookie, they should spread the extracted chocolate chips onto the area they marked and compare the amount recovered to their initial estimate.

Have the students observe what is left of their cookie and discuss how this reflects the impacts

of mining operations.

Instruct the students to "clean up" their mining site by using their digestive systems to bioremediate the mining wastes and extracted ore deposits.

(In other words, they can eat the cookie remains along with the chocolate chips!)

Going Further

During both the mining and use of coal, environmental impacts occur. Have the students mine another cookie and this time only remove deposits of chocolate that can be mined near the surface with minimal environmental disturbance. Have the class discuss the following issue:

What is the balance between how much coal resources are technically available and the increasing environmental and economic costs associated with obtaining and using all of this coal?

Assessment and Inquiry

Have the students answer the following questions:

- Think about how your cookie looked after you finished mining. How does this relate to the topographical environmental disturbance associated with real coal mining?
- Based on your cookie-mining experience, can you explain why, in actual coal

- mining situations, some deposits of coal are more expensive to obtain?
- Why is it difficult to predict exactly how long the fossil fuels in the earth will last?
 - Define the following terms and give some examples:
 - Renewable energy source
 - Nonrenewable energy source

This activity was adapted from the National Renewable Energy Laboratory (NREL) Teacher Activity Guide.

Bryan Hopkins is an environmental education specialist with the department's [Outreach and Assistance Center](#).

MISSOURI

resources

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The Civilian Conservation Corps (CCC) was organized in 1933 by the U.S. Department of the Interior to help bring outdoor recreation closer to the country's growing metropolitan areas. It also served to put many young men from the Depression era to work.



Here, CCC enrollees quarry stone for use in construction projects in Cuivre River Park, a federal acquisition that began in 1934. Besides the hard work of building roads, fences and walkways, CCC workers used stone indigenous to a given area for buildings, shelters and other structures. Many of the structures are standing today and efforts are ongoing to restore them to their original beauty. Cuivre River was transferred to the Missouri state park system in 1946. A feature on the park appeared in the Fall 1999 issue of *Missouri Resources* and can be accessed at [www.dnr.state.mo.us/magazine/1999_fall/resources_to_explore.htm].

Send your photo to "Time Exposures," c/o [Missouri Resources](#), P.O. Box 176, Jefferson City, MO 65102-0176. All pictures will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the time and location of the picture, a brief description and any related historic details that might be of interest to our readers.